JRSSEM
JOURNAL RESEARCH OF SOCIAL SCIENCE,
ECONOMICS, AND MANAGEMENT

Analysis of the Factors Influencing Willingness to Connect in *Sistem Penyediaan Air Minum* (Spam)/Drinking Water Supply System (Dwss) Pekanbaru Riau Using Binary Logistic Regression Method

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Keywords:
Willingness to connect; Binary Logistic Regression; SPAM/DWSS Pekanbaru; economic factors; income

Abstract

To fulfill the needs for clean water in Pekanbaru City and Kampar Regency Riau, Perusahaan Daerah Air Minum(PDAM)/Drinking Water Regional Enterprise (DWRE) in collaboration with an investor company is building piping network infrastructure known as the Pekanbaru – Riau Sistem Penyediaan Air Minum (SPAM)/Drinking Water Supply System (DWSS). This SPAM/DWSS has an important role in fulfilling the needs for clean water in the community. However, its operational sustainability is highly dependent on the ability of potential customers to pay for the services (willingness to connect). This study aims to analyze factors influencing the willingness to connect for prospective customers of SPAM/DWSS Pekanbaru – Kampar by using the binary logistic regression method. The independent variables analyzed include economic, social, and demographic factors, such as age, occupation, household income, education level, and customer perception of water tariffs. The data were collected through a survey conducted by RH Consultants to 2,000 respondents of domestic customers and 1,500 respondents of commercial and industrial customers to determine the most significant factors influencing the willingness to connect. The results showed that household income has a significant influence on the willingness to connect for potential customers. These findings provide insights for SPAM/DWSS managers and local governments in designing more equitable and sustainable tariffs and policies.

INTRODUCTION

Clean water as a basic human need must be readily available to support our daily life (A. Mishra & Tushaus, 2022; R. K. Mishra, 2023; Organization, 2022b; Pérez-Beltrán et al., 2024). The government, through various policies and programs, must make efforts to provide good quality drinking water services for the community, one of which is through the *Sistem Penyediaan Air Minum* (SPAM)/Drinking Water Supply System (DWSS), which was built to ensure the availability of decent, safe, and affordable clean water for all levels of society (Ajith et al., 2022; Bazaanah & Mothapo, 2024; Okafor et al., 2024; Organization, 2022a, 2022b).

The vision of Indonesia as written in the 1945 State Constitution, with its sovereignty, developed, and sustainable principles, has been designed in the 2025–2045 Rencana Jangka

Panjang Pembangunan Nasional (RPJPN) or National Long-Term Development Plan (NLTDP) (Sutrisno & Setiawan, 2021). In pursuit of this vision, there are 5 (five) main goals to be achieved, namely achieving per capita income equivalent to developed countries, reducing poverty and inequality, increasing Indonesia's leadership and influence in the international world, increasing the competitiveness of human resources, and decreasing greenhouse gas (GHG) emissions toward net zero emissions (Prasetyo & Yuliana, 2020; Fitria, 2021). Achieving per capita income equivalent to developed countries requires a comprehensive strategy involving economic growth and equitable distribution (Kurniawan & Salim, 2020). Reducing poverty and inequality is closely tied to inclusive development policies that target marginalized communities (Suryadi & Kurniawati, 2021). Furthermore, Indonesia's leadership in the international world depends on strengthening its diplomatic and economic positions, which must be backed by strategic development in human capital (Rizki & Hidayat, 2021). Lastly, Indonesia's commitment to reducing GHG emissions and moving toward net zero emissions is part of global efforts to combat climate change (Taufik & Fitriani, 2022).

From the vision and main goals of Indonesia to establish Golden Indonesia 2045, 8 (eight) development missions (agendas) have been set (Hasanah & Zaki, 2023; Thawley et al., 2024). They are Social Transformation, Economic Transformation, Governance Transformation, Rule of Law, Stability and Indonesian Leadership, Socio-Cultural and Ecological Resilience, Fair and Impartial Regional Development, Quality and Environmentally Friendly Facilities and Infrastructure, and Sustainable Development.

To achieve this vision and mission, sustainable and safe drinking water is needed as a basic human need. Based on Law Number 23 of 2014 concerning Regional Government and Government Regulation Number 122 of 2015 concerning the Implementation of Drinking Water Supply System, the Government is obliged to carry out the implementation of SPAM/DWSS in accordance with its authority. To support the implementation of these tasks, the Government is authorized to form *Badan Usaha Milik Negara* (BUMN)/State-Owned Enterprises (SOE) or *Badan Usaha Milik Daerah* (BUMD)/Regionally-Owned Enterprises (ROE) engaged in the drinking water sector as operators. This SOE or ROE has the obligation to carry out the management, operation, and maintenance of SPAM/DWSS so that drinking water services to the community could run effectively and sustainably.

Currently, SOE or ROE—in this case, *Perusahaan Daerah Air Minum* (PDAM)/Drinking Water Regional Enterprise (DWRE)—collaborates with investors in the development of SPAM/DWSS in Indonesia, where water has not been received evenly in every region. Various factors and obstacles are experienced by PDAM/DWRE in developing SPAM/DWSS, one of which is the fact that there are still many people using groundwater for their daily needs. This is a challenge for PDAM/DWRE in building public awareness about the dangers of continuous excessive groundwater use in the long term. Various socialization programs have been carried out by the Government and PDAM/DWRE regarding the dangers of using groundwater on the environment, and invitations to switch to PDAM/DWRE water have been spread. One of the institutions that plays an active role in this socialization is the *Badan Riset dan Inovasi Nasional* (BRIN)/National Research and Innovation Agency (NRIA), which reminds the public of the importance of

understanding the adverse effects of excessive groundwater pumping on the environment. This practice could trigger land subsidence, which has the potential to cause various serious problems.

A researcher at the NRIA Geological Disaster Research Center, Dwi Sarah, said that this land subsidence has a close relationship with the increasing frequency of flash floods in coastal areas. This occurs due to the increase in sea level every year, which is exacerbated by massive land subsidence activities. Therefore, the community is asked to be wiser and more responsible in the use of groundwater to prevent the increasingly widespread adverse impacts on the environment and human life. NRIA is actively conducting research through independent, internal, external, and collaborative funding to study the dangers of land subsidence, which is a multi-dimensional problem and has a serious impact on people's lives. This research includes an in-depth study of the causes, impacts, and solutions that could be taken to prevent these disasters. Therefore, it is highly recommended for communities and policymakers to switch from groundwater to piped water to reduce the risk of land subsidence and protect environmental sustainability.

SPAM/DWSS Pekanbaru is one of the drinking water supply systems that operates with a production capacity of 1,000 liters per second to serve clean water needs in the Pekanbaru City and Kampar Regency areas. The sustainability of this SPAM service is highly dependent on various factors, one of which is the interest of potential customers to subscribe to SPAM/DWSS water or their willingness to connect.
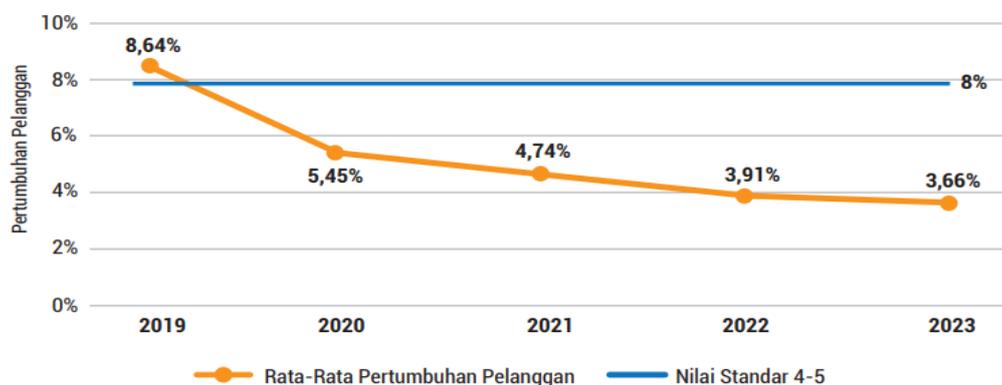
Figure 1. Average Value of
PDAM/DWRE National Customer Growth
for 2019-2023 Fiscal Year
(Source: SOE Performance Book of Drinking Water Executive Summary in 2024)
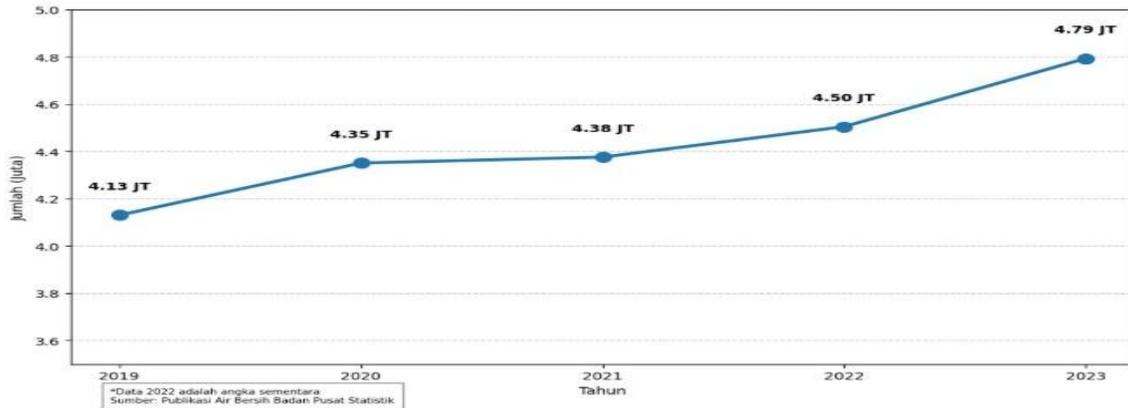
Figure 2. Amount of Clean Water Distributed by Clean Water Company
(Source: Clean Water Publication of the Central Statistics Agency)

Looking at the growing population, the amount of water distributed is also increasing, as seen in Graph 2, but Graph 1 shows that the growth of PDAM/DWRE customers is decreasing. This means that there is a problem with people who are not interested in subscribing to PDAM/DWRE water. Interest in subscribing among potential PDAM/DWRE customers is an important issue in the sustainability of SPAM/DWSS services because low willingness to connect could cause significant absorption delays. The impacts include decreasing the company's revenue, affecting service continuity, and disrupting the overall operation and quality of SPAM/DWSS services. Based on these problems, it is important to analyze the factors that affect the willingness to connect for potential customers so that companies can choose the right marketing strategy.

Various factors could affect the willingness to connect, such as economic factors (household income, expenditure level), social factors (number of family members, education level), and customer perception factors on rates and service quality. To understand the relationship between these factors and willingness to connect, this study applied the binary logistic regression method. This method is applied because the dependent variable in this study is binary, namely customers who are interested or not interested in subscribing to Pekanbaru Riau SPAM/DWSS water.
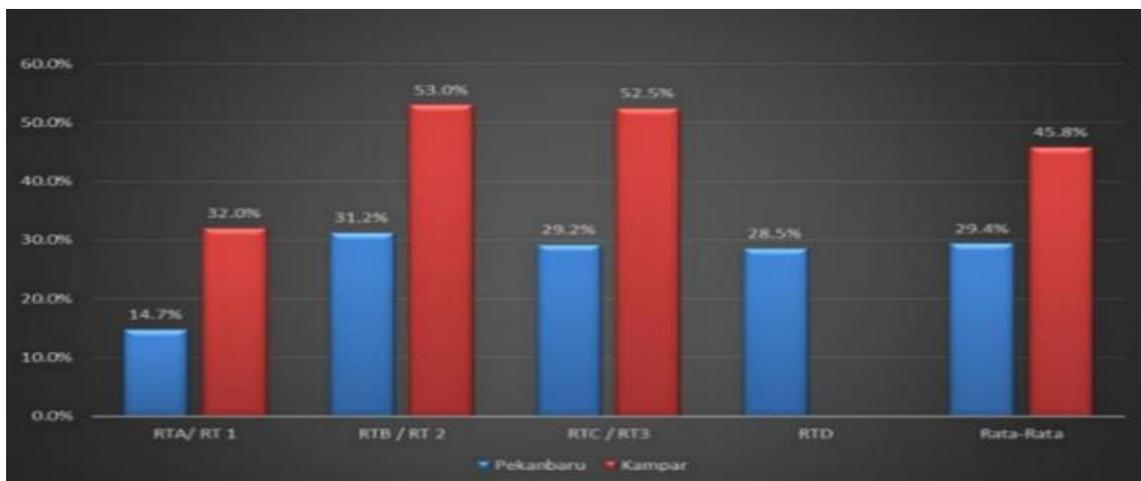
Domestic respondents in Pekanbaru showed 28% interest in connecting to the piped water network, while respondents in Kampar showed higher interest at around 40%. These data indicate that there is significant potential for the development of piped water networks, especially in Kampar.

The novelty of this study lies in its application of binary logistic regression to primary survey data from a large-scale SPAM project in Indonesia, offering a quantitative and contextually grounded analysis of WTC. This research moves beyond descriptive statistics to provide a predictive model that can identify the most significant determinants of willingness to connect. By focusing on the Pekanbaru-Riau SPAM, the study provides actionable insights for a specific, ongoing infrastructure investment, allowing for the formulation of targeted interventions. The primary objective is to identify which among the socio-economic and demographic factors—age, education, occupation, and income—significantly influence a potential customer's decision to connect to the SPAM/DWSS network.

This study aims to identify factors that significantly affect the willingness to connect of potential Pekanbaru Riau SPAM/DWSS customers. In addition, this study also aims to determine the extent to which factors such as age, education, occupation, and income of potential customers influence the willingness to connect to SPAM/DWSS. The results of this study are expected to provide comprehensive insights and recommendations for SPAM/DWSS managers and local governments in developing targeted policies. By utilizing these findings, it is hoped that they will be able to formulate more effective and efficient marketing strategies, as well as design fair, transparent, and sustainable clean water tariff policies. In addition, the policies formulated are expected to increase public awareness of the importance of access to clean water and maintain the sustainability of SPAM/DWSS services. With this, access to clean water could be maintained for all levels of society so that public welfare and health could improve continuously.

With this research, it is hoped that SPAM/DWSS managers and stakeholders could optimize drinking water service policies that are more responsive to customers' economic and social conditions so that the sustainability of clean water services could be maintained. This research also provides more comprehensive data and information about customer behavior and preferences, which could later be used as a basis for improving drinking water service policies and strategies. In addition, the results of this research could serve as a reference in making more targeted decisions, so that it could increase the effectiveness of drinking water service programs and provide real benefits to the wider community.

MATERIALS AND METHODS

This research was carried out by collecting data on domestic potential customers in 5 (five) sub-districts located in two areas around the location of *Sistem Penyediaan Air Minum* (SPAM)/Drinking Water Supply System (DWSS) Pekanbaru Riau, namely Pekanbaru City and Kampar Regency. For the Pekanbaru City area, there are three sub-districts, namely Tampan District, Marpoyan Damai District, and Bukit Raya District. Meanwhile, the Kampar Regency area consists of two sub-districts, namely Tambang District and Siak Hulu District. A total of 200 potential customers with various backgrounds were surveyed. This study focuses on finding out the variables that most influence potential customers in deciding to

subscribe to SPAM/DWSS water.

The sampling technique used in this study is a questionnaire distributed to potential customers to collect data about their background. This study uses Binary Logistic Regression analysis on the IBM SPSS application. Binary Logistic Regression is a data analysis method used to examine the influence of a dependent variable (y) that has a binary category with independent variables (x) that are polychotomous. Binary Logistic Regression is relatively easy to apply and understand. This makes it a good choice for initial analysis or when model interpretation is important (Permanasari et al., 2024).

The variables used in this study included customer age, customer education, customer employment, and income level. The output of the dependent variable consists of 2 types, which are usually interpreted as y = 1, meaning that the customer is interested in connecting to SPAM/DWSS water, and y = 0, meaning that the customer is not interested in connecting to SPAM/DWSS water. The Binary Logistic Regression method will produce a Sig. value. A Sig. value of less than 0.05 indicates that the variable has a significant influence on the interest of potential customers to subscribe to Pekanbaru Riau SPAM/DWSS water. The variables that have a significant influence will be followed up by calculating Binary Logistic Regression using the following formula:

$$y = \frac{1}{1 + \exp^{(-(C + \beta 1 X1 + \beta 2 X2))}}$$

By using this analysis method, the research could provide in-depth insights into factors that affect people's subscription decisions to SPAM/DWSS Pekanbaru Riau. The results of this analysis are expected to provide useful recommendations for SPAM/DWSS Pekanbaru Riau and related stakeholders in designing marketing strategies and pipeline construction strategies for potential customers in more effective and efficient ways.

RESULTS AND DISCUSSION

The data used by the authors is data drawn from the results of the questionnaire with the following results:

Table 1. Dependent Variables and Independent Variables

Dependent Variable	Independent Variables
Potential Customer's Interest in Subscription to SPAM/DWSS (Y) Water	Age (X1)
	Education (X2)
	Occupation (X3)
	Revenue (X4)

From the variables specified above, the authors conducted a binary logistics regression analysis to identify the variables that have a significant influence on the interest of potential customers to subscribe SPAM/DWSS water. The analysis process was carried out by taking 200 samples with independent variables in table 1, which then calculated using the SPSS program. The following are the results of the analysis (Table 2):

Table 2. Binary Logistics Regression Test Results
Classification Table[a]

Observed		Predicted .00	Predicted .01	Percentage Correct
binary	.00	99	1	99.0
	1.00	47	53	53.0
Overall Percentage				76.0

Variables in the equation

Variable	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for Exp(B)
work	0.099	0.065	2.297	1	0.130	1.104	0.971 - 1.255
education	-0.012	0.160	0.006	1	0.940	0.988	0.722 - 1.353
income	4.653	1.037	20.131	1	<0.001	104.936	13.744 - 801.192
age	0.004	0.018	0.061	1	0.806	1.004	0.970 - 1.040
Constant	-6.248	1.763	12.565	1	<0.001	0.002	0.000 - 0.002

From the table above, variables that have significant effect on the interest of potential customers to subscribe to SPAM/DWSS water are shown with a sig value of < 0.05 so that the conclusion of the table above is

1. Income variables have a significant influence.
2. The variables of age, education and occupation did not have a significant effect.

The variable which has significant effect, which is income, then reprocessed using the SPSS application by removing variables that do not have a significant effect. The results of the calculation obtained is as follows (Table 3):

Table 3. Binary Logistics Regression Test Results (Advanced)
Classification Table[a]

Observed	Predicted .00	Predicted .01	Percentage Correct
binary .00	99	1	99.0%
binary .01	47	53	53.0%
Overall Percentage			76.0%

Variables in the equation

Variable	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for Exp(B)
income	4.510	1.025	19.376	1	<0.001	90.959	12.208 - 677.708
Constant	-5.255	1.069	24.147	1	<0.001	0.005	0.000 - 0.005

The analysis result of the variables that have a significant influence could produce a regression formula to predict the interest in SPAM/DWSS Pekanbaru-Riau subscription as follows:

$$y = \frac{1}{1 + exp^{(-(C + \beta 1 X 1 + \beta 2 X 2))}}$$

$$y = \frac{1}{1 + exp^{(-((-5,255) + (4,510 X 1)))}}$$

Based on the observation data above, there are 47+53=100 prospective customers who are interested in subscribing to Pekanbaru-Riau SPAM/DWSS water and 99+1=100 prospective customers who are not interested in subscribing to SPAM/DWSS water. The

results of this research could be used as a basis for decision-making in a SPAM/DWSS company. Based on the results of the analysis using the binary logistics regression method, the variable that has significant effect on the interest in SPAM/DWSS subscriptions is income.

CONCLUSION

This study identified income as the primary variable significantly influencing the subscription interest of prospective *Sistem Penyediaan Air Minum* (SPAM)/Drinking Water Supply System (DWSS) Pekanbaru Riau customers through Binary Logistic Regression analysis, with findings suggesting that potential customers earning ≥Rp3,000,000 are more likely to pay their water bills. Based on these results, SPAM/DWSS Pekanbaru Riau is recommended to adopt targeted strategies such as income-based market segmentation, more selective investment in construction sites aligned with high-impact customer profiles, and value-added promotions — including discounts and public education campaigns on the benefits of SPAM/DWSS water — to grow its customer base and increase revenue. For future research, it is recommended that additional socioeconomic and behavioral variables, such as household size, existing water source satisfaction, and proximity to the distribution network, be incorporated into the model to yield a more comprehensive understanding of subscription willingness and to further strengthen the basis for strategic decision-making by the company.

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